Appendices

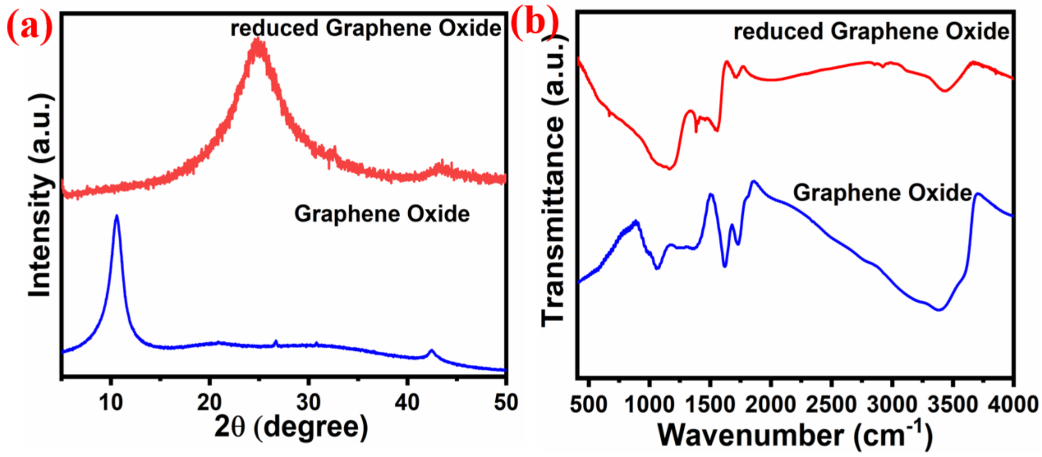

Fig. A.1 (a) XRD pattern and FT-IR spectra (b) of graphene oxide (GO) and reduced graphene oxide (rGO) after their individual hydrothermal treatment at 200°C for 16 h.

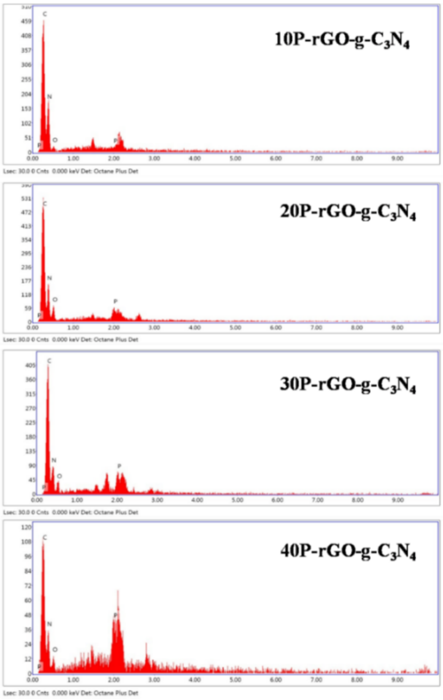

Fig. A.2 EDX spectrum of 10P-rGO-g-C_3N_4, 20P-rGO-g-C_3N_4, 30P-rGO-g-C_3N_4 and 40P-rGO-g-C_3N_4 composites

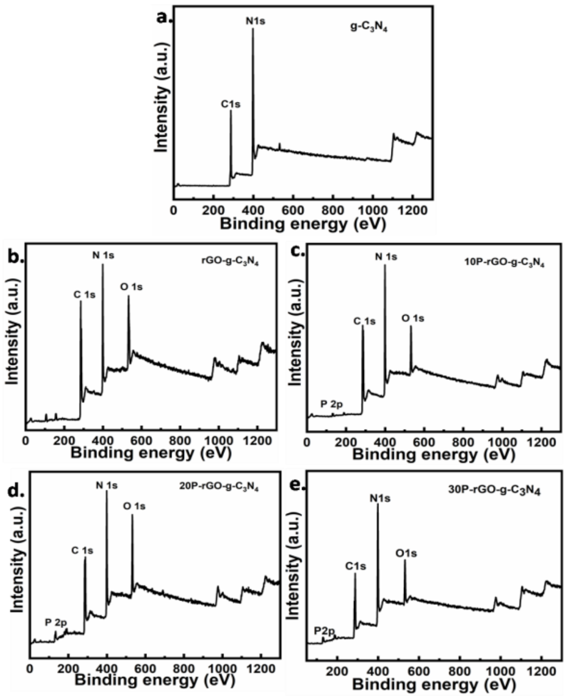

Fig. A.3 XPS survey spectrum of g-C_3N_4, rGO-g-C_3N_4, 10P-rGO-g-C_3N_4, 20P-rGO-g-C_3N_4 and 30P-rGO-g-C_3N_4.

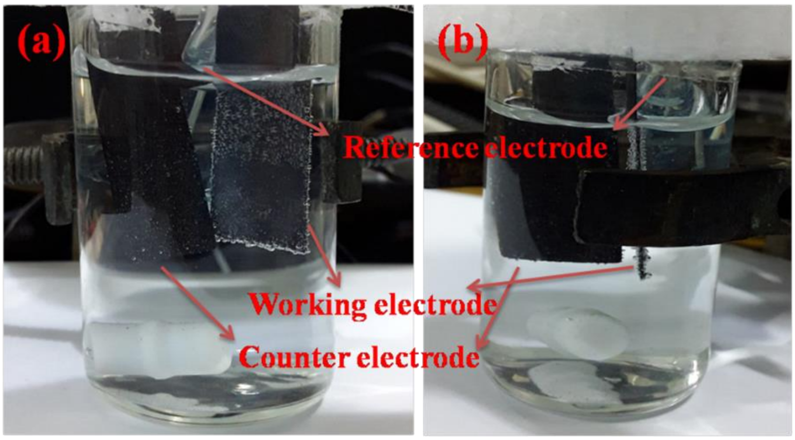

Fig. A.4 (a) Images of electrochemical set up for testing HER stability in 0.5M H_2SO_4 and Fig A.4 (b) shows the lateral view of working electrode (Toray carbon paper) with lots of H_2 bubbles stationed over the Toray carbon paper and leaving out it.

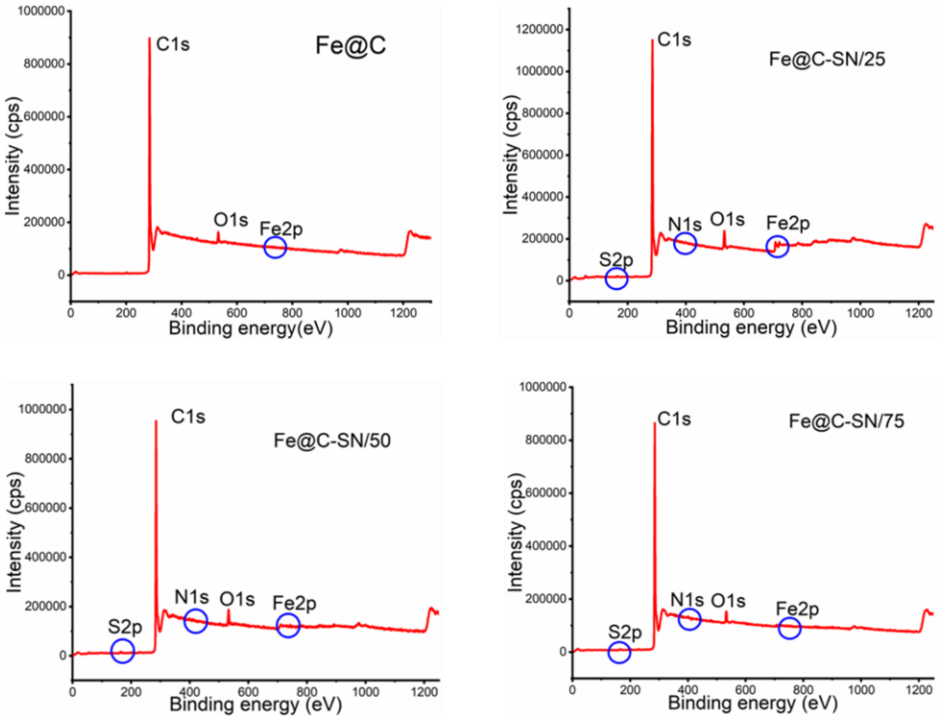

Fig. A.5 Full scan XPS survey spectrum of all doped species and undoped Fe@C.

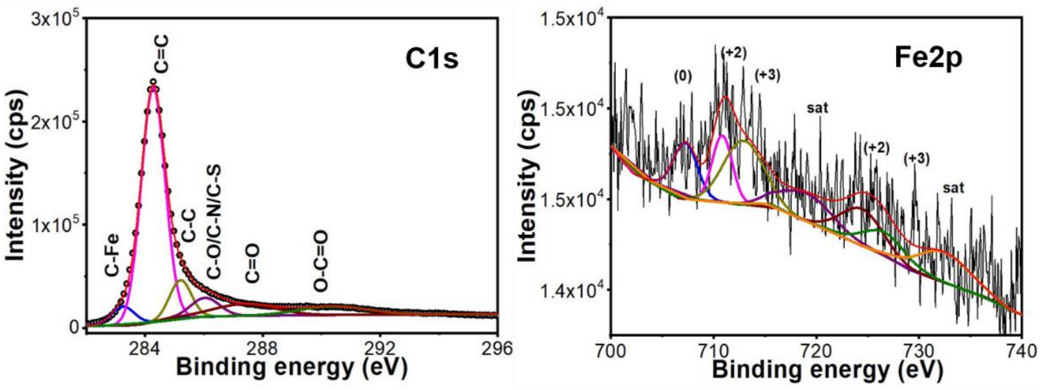

Fig. A.6 High resolution C1s and Fe2p XPS peaks of undoped Fe@C.

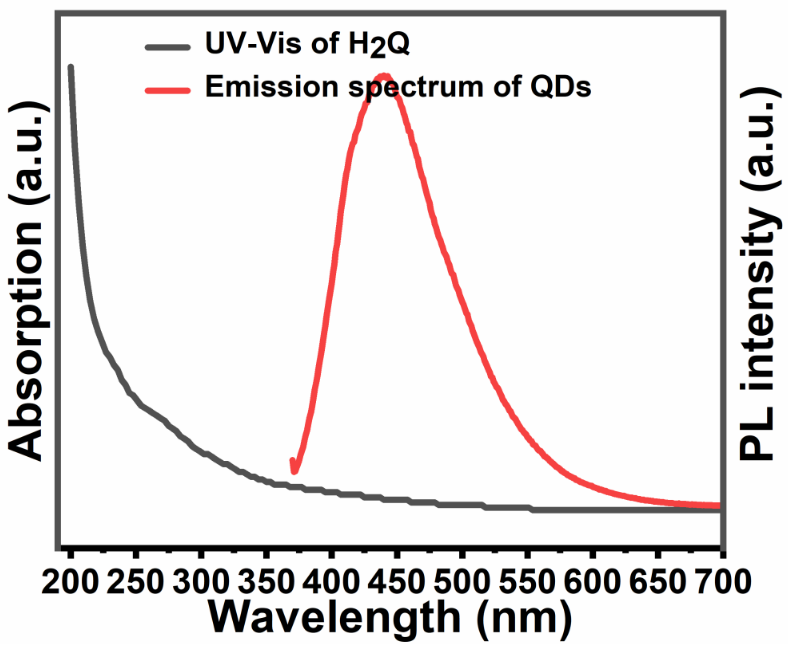

Fig. A.7 UV-Visible absorption spectrum of H_2Q and emission spectrum of as-prepared CNQDs.

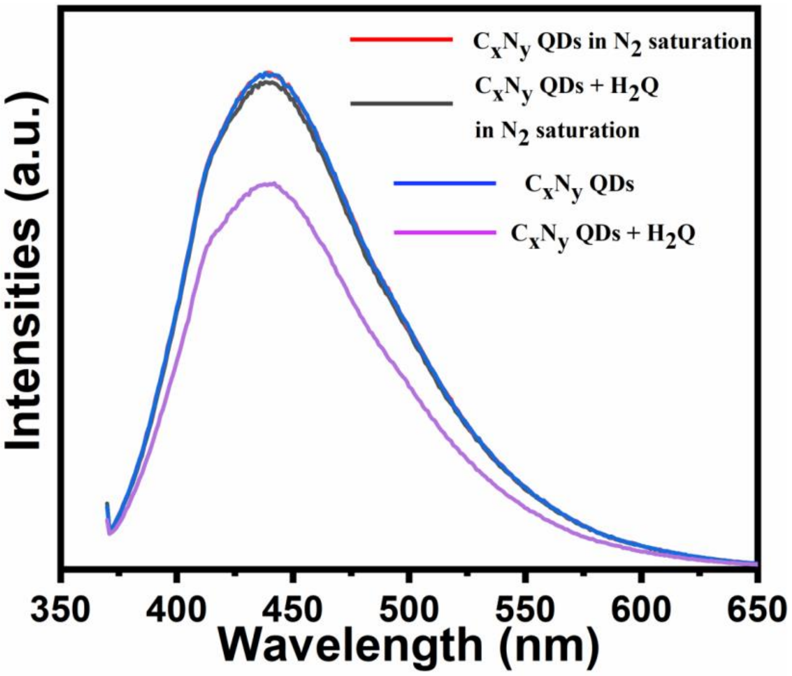

Fig. A.8 Quenching of PL intensity of C_xN_y QDs by H_2Q in 7.4 pH phosphate buffer solution (PBS) and in N_2 saturated PBS solution.

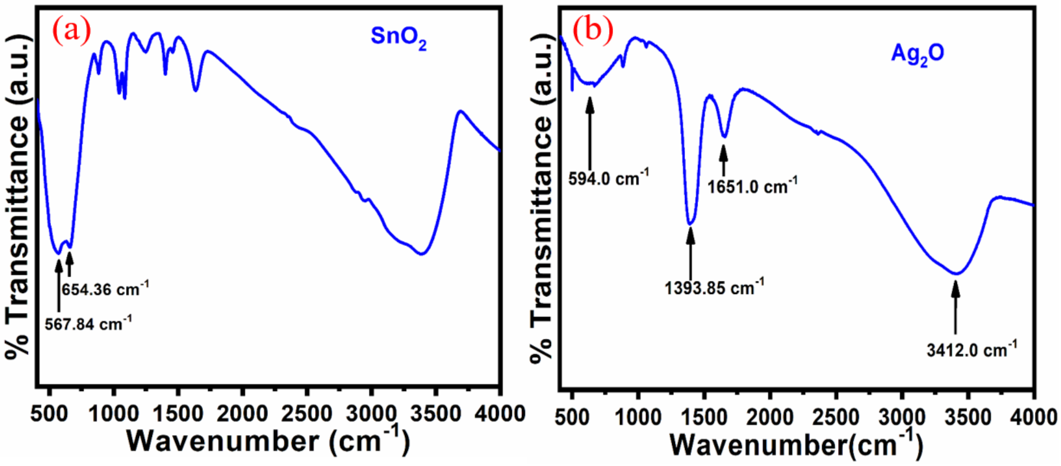

Fig. A.9 Vibration spectra of (a) SnO$_2$ and (b) Ag$_2$O nanoparticles.

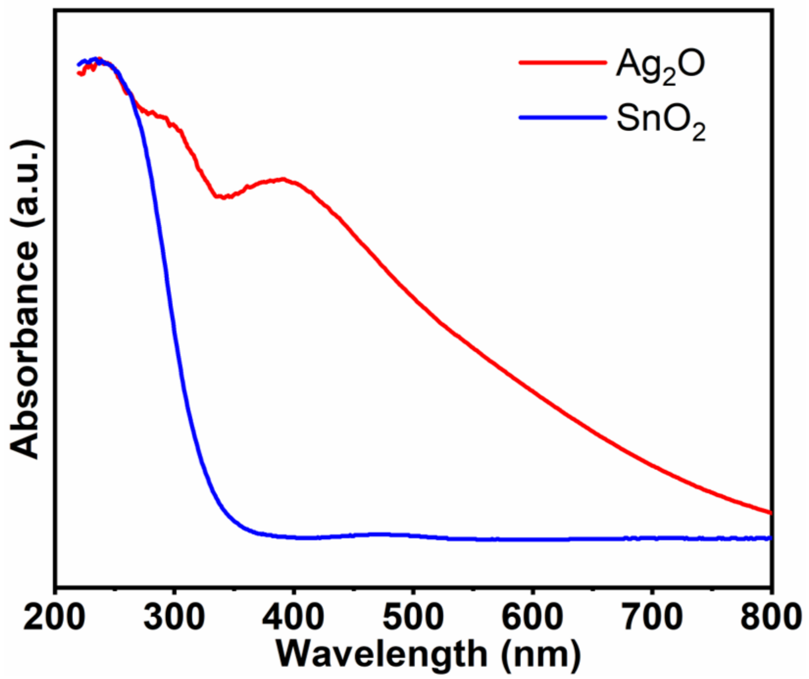

Fig. A.10 UV-visible DRS spectra of Ag$_2$O and SnO$_2$ nanoparticles.

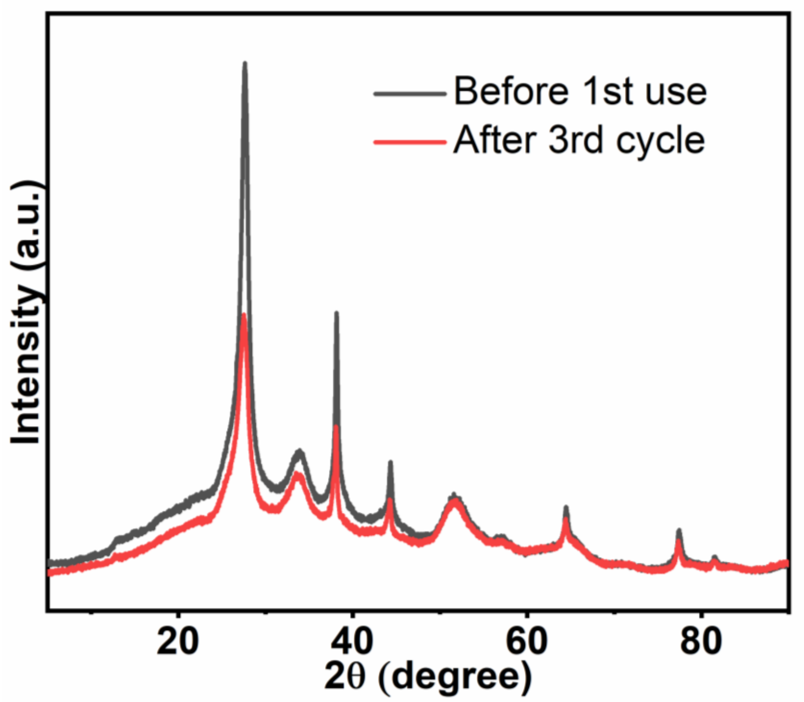

Fig. A.11 XRD pattern of ternary composites 25% $Ag_2O/SnO_2@g\text{-}C_3N_4$ before use and after 3rd photocatalytic run.

Table A.1 Correlative assignments of all the major vibrational peaks (in cm^{-1}) of individuals and composites.

Composites	**Triazine Units**	**N-H**	**O-H**	**sp^2- C**	**P=O**
g-C_3N_4	807.6	3187.2	merged	1550.0	1634.1
rGO	-	-	3440.5	1542.2	-
rGO-g-C_3N_4	809.0	3190.5	merged	1545.7	-
10P-rGO-g-C_3N_4	807.9	3167.6	merged	1560.0	1645.2
20P-rGO-g-C_3N_4	810.1	3187.8	merged	1569.5	1678.6
30P-rGO-g-C_3N_4	808.2	3157.8	merged	1545.4	1684.3
40P-rGO-g-C_3N_4	808.2	3187.0	merged	1574.3	1634.7

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Table A.2 Binding energy of various binding states of elements present in the as-prepared samples from XPS analysis.

C1s	**Fe@C B.E. (eV)**	**Fe@C-SN/25 B.E. (eV)**	**Fe@C-SN/50 B.E. (eV)**	**Fe@C-SN/75 B. E. (eV)**
C-Metal	283.2	283.5	283.9	283.4
C=C	284.3	284.4	284.8	284.5
C-C	285.2	285.2	285.4	285.2
C-O/C-N/C-S	286.0	286.4	286.5	286.5
C=O	287.4	288.4	288.8	288.4
COOH	290.4	290.9	291.4	290.3
N1s				
Pyridinic	-	398.3	398.3	398.3
Amino	-	399.2	399.2	399.2
Pyrrolic	-	400.1	400.1	400.1
Graphitic	-	401.4	401.4	401.4
Oxidized N	-	403.1	403.3	403.3
Fe2p				
0	707.2	707.3	707.8	707.7
$2p_{3/2}$ 2+	710.8	710.6	711.1	710.3
3+	712.9	713.9	714.7	713.7
sat	718.9	720.2	720.6	720.6
$2p_{1/2}$ 2+	724.4	723.9	724.3	724.4
3+	726.6	726.7	727.6	728.2
sat	732.5	733.2	732.6	732.5
S2p				
C-S-C	-	162.2	162.8	162.9
C-S-H	-	163.8	164.0	163.9
Thiophene	-	165.2	165.1	165.1
-SO_3H	-	168.1	168.2	168.1
Oxidized S	-	169.4	169.3	169.4

Table A.3 Peak assignment of various peaks obtained along with area and FWHM values from Raman analysis.

	Peak Position (cm^{-1})	Area	FWHM
Fe@C	1246	1040	119
	1341	3803	108
	1450	1425	166
	1580	2189	68
	1604	353	52
Fe@C-SN/25	1254	452	138
	1346	1814	71
	1450	335	158
	1574	1152	65
	1604	326	59
Fe@C-SN/50	1247	14480	165
	1331	89351	62
	1450	24407	248
	1581	28361	57
	1605	12551	50
Fe@C-SN/75	1246	1449	121
	1344	18149	75
	1450	3904	224
	1572	8739	55
	1604	2139	44

Table A.4 Electrochemical analysis of doped and undoped Fe@C species.

Catalysts	***η* @10 mA cm^{-2} (mV)**	**Onset potential (mV)**	**Tafel slope (mV dec^{-1})**
Fe@C	-	486	155
Fe@C-SN/25	537	414	94
Fe@C-SN/50	520	372	123
Fe@C-SN/75	567	435	107

Appendix - B

Morphology Control Synthesis of g-C_3N_4 and Doping with Alkali Metal Ions for Greater Charge Storage

B.1 Introduction

Energy conversion and its storage have always remained an integral part of these tech-savvy humans. Electrochemical energy derived from renewable sources is clean and affordable, its storage is also required at low cost and should be transportable with a handier in use. [153, 154] Supercapacitors are primary storage device that stores and release energy by reversible adsorption-desorption of ions at electrode-electrolyte face. [41,43] These devices have high Coulombic efficiencies and high-power densities with long charge-discharge cycles. It is mostly deployed as a power backup and in portable electronic devices. Carbon has served as promising storage materials among other classes by virtue of its greater surface area, greater conductivity and stability besides being naturally abundant. Several, carbon-based supercapacitors have taken over the electronic market having features of charge-discharge cycles in million, higher coulombic efficiencies and operability in aqueous/non-aqueous media. [73] However, in the nonaqueous electrolyte, these devices have low energy densities, mostly < 10 W h kg^{-1}. [41,143]

The presence of heteroatoms into carbon surroundings has always resulted in its enhancement of storage properties, credit to lone electron pairs of heteroatoms which alter the donor-acceptor behaviour of carbon material leading to greater capacitance by pseudo-capacitance facilitated by the surface faradic reaction. [73] Nitrogen as heteroatom has greatly served the purpose of enhancement in electrochemical activity and storage, it also enhances wettability and conductivity of the electrode, when present in form of —NH_2/=NH. [44-46] Introduction of N into carbon material is achieved through many routes, but when N remains present as an inherent part of the carbon framework as in g-C_3N_4, there is great scope to harness its energy storage properties through certain structural modification and doping of metal ions at interlayers of g-C_3N_4 sheets. Although the low conductivity and low surface area of bulk g-C_3N_4 have remained major obstacles for its implication into energy storage fields, however as hybrid and heterostructures, research effort is on to unlock its potential. [47,72] Nanostructuring of g-C_3N_4 such as in form of tubes, wires, ribbons, spheres, nanosheets has exhibited greater efficiency for both electro and photo domains owing to the high specific surface area, hence greater exposure of sites and interaction. [60,71] Morphology control of graphitic carbon nitride in form of tubular g-C_3N_4 prepared by Tahir et al. exhibited larger specific capacitance (C_S = 233 F g^{-1} at a current density of 0.2 A g^{-1}) and a specific surface area of 182.61 m^2 g^{-1}. Tahir et al. also prepared g-C_3N_4 nanofibers (GCNNFs) as supercapacitor electrode exhibiting C_S value of 263.75 F g^{-1} and specific surface area of ~165 m^2 g^{-1}. [74,75] Composites of g-C_3N_4 with various nanostructured carbon materials, transition metal oxides and hydroxides, doping of metal/non-metal, metal sulfide, conducting polymers and metal-organic framework (MOF) have resultant in enhancement in specific capacitance (C_S) credit to the synergism of constituents. [253-257] These advancements have directed the view of researchers working on g-C_3N_4 based composite to further explore it as a potential charge storing material and to see it as a substitute for commercial carbon-based supercapacitors.

The presence of metal ions (Na^+/K^+) and non-metals (red P and B) into the intercalation of sheets of g-C_3N_4 alters surface area and enhances the conductivity and overall charge storage performance. [256] The Source of these dopants are cheap chemicals and salts, Ansari et al. reported 30 wt. % red Phosphorous doped g-C_3N_4 prepared by ball milling method exhibits large capacitance of 465 F g^{-1} attributing to synergism between the capacitive property of red P and N rich framework of carbon nitride. [258] Other such doping reports are of boron using ionic liquid both as pore template and as dopant source and of Na^+ and K^+ using XBr salt (X=Na/K). In the case of Na/K doped g-C_3N_4 reported by Xiong et al., metal ions intercalate into the g-C_3N_4 layers via bridging the layer resulting in extended π conjugation. [259] K doped g-C_3N_4 displays better efficiency, this knowledge was further employed in g-C_3N_4/MnO_2 composites to achieve greater capacitance.

Encouraged by these developments, we strategized to bring morphological change in g-C_3N_4, simultaneously doping alkali metal ion for charge storage application. We chose the alkali metal ions Li^+/Na^+/K^+ in form of their salts (MCl; M = Li/Na/K) in a fixed weight amount into acid-treated melamine for the preparation of porous structure of doped g-C_3N_4. Ethylene glycol was used as the dispersion medium, while treating melamine precursor with 0.1 M HNO_3. Ethylene glycol helps in carbonization by addition of its carbon into g-C_3N_4 and provides structural stability to g-C_3N_4 as reported by Tahir et al. [74,75] Thermal treatment of a mixture of metal salts (MCl) + acid-treated melamine at 450 °C yields metal ion intercalated porous g-C_3N_4 indicated as 'pCN-M' (M = Li/Na/K^+), which was further used as such for electrode material. Different-sized metal ions have different intercalation abilities, that influence the charge storage features. The electrochemical study of pCN-M performed in basic media exhibits a many-fold increase in charge storage properties corelated to the order of size of alkali metal ions present in the structure. The smallest alkali metal ion Li^+ has greater intercalation and enhancement in charging-discharging of porous g-C_3N_4 to other counterparts. Further optimization of pCN-Li by varying the doping amount of Li^+ has an impact over its supercapacitor behaviour as compared to parental material.

B.2 Experimental Section

B.2.1 Materials Melamine (Extra Pure) was ordered from Loba Chemie, India; Ethylene Glycol (For Analysis) and NaCl from Merck, India; LiCl and KCl salts were procured from SRL chemicals. All these chemicals were used as such without any further purification. 0.1M HNO_3 was prepared by diluting 36 % conc. HNO_3 procured from Merck-Sigma in double-distilled water.

B.2.2 Synthesis of Porous g-C_3N_4 (p-CN)

1 gram of Melamine (Extra Pure) was dispersed into 30 ml of Ethylene Glycol under stirring for 30 minutes, it gives a saturated solution of melamine. 120 ml of 0.1 M HNO_3 was added into the dispersion and kept at stirring for another 12 h. We obtained a white fluffy or gel-like solution which was filtered under vacuum and washed with 20 ml of crude ethanol. The white fluffy solid was dried overnight in a vacuum oven at 80°C. The dried fluffy solid was transferred into an alumina crucible covered with the lid and annealed at 450 °C for 2 h at the ramping rate of 10 °C/min into the muffle furnace in the closed air. The recovered light-yellow powder was fluffy in appearance and termed as ‘pCN’ (porous g-C_3N_4). It was preserved as such for further characterization and study purposes. Figure B.1 depicts the schematic presentation of the synthesis protocol.

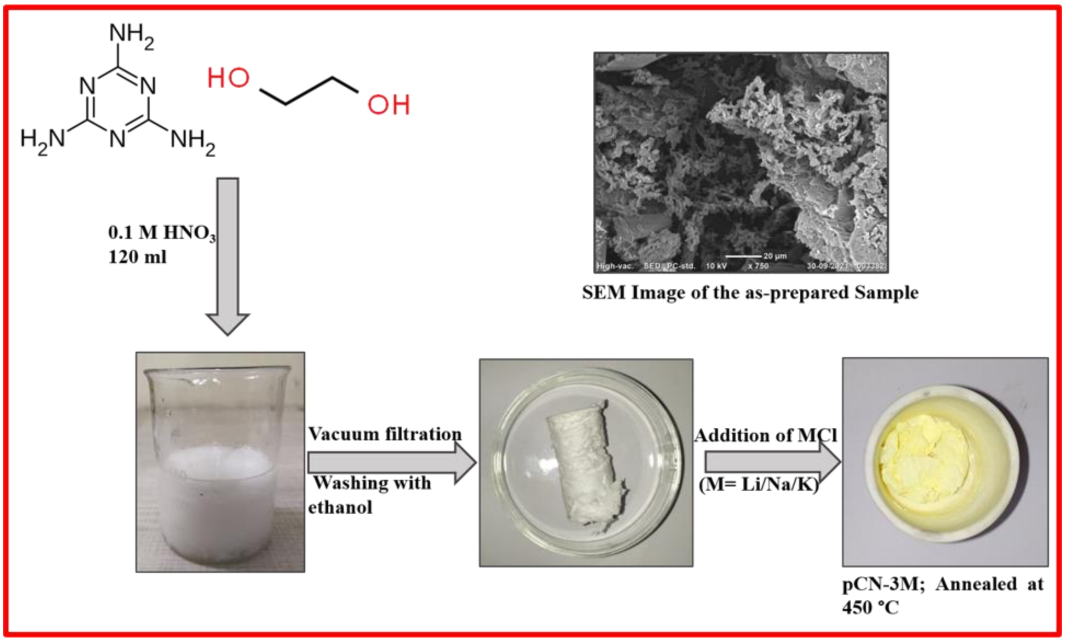

Fig. B.1 Schematic presentation of the synthesis of alkali metal-doped porous g-C_3N_4 (pCN-3M).

B.2.3 Synthesis of Alkali Metals Doped Porous g-C_3N_4 (pCN-M; M = Li/Na/K)

Alkali metals ions were introduced into porous g-C_3N_4 structure simultaneously during the synthesis process. First, we took the white fluffy solid dried in a vacuum oven and added the 3 wt. % of metal salt's (viz. LiCl, NaCl and KCl) solution dropwise into the solid and dried the powder material. This combination of alkali metal salt + acid-treated melamine mixture was homogenized into the agate mortar properly. The obtained mixture powder was transferred into an alumina crucible covered with the lid and annealed under the same condition as in the porous g-C_3N_4 (pCN) synthesis. The obtained alkali metal-doped porous g-C_3N_4 was termed as pCN-3M; M = Li/Na/K. A similar approach was followed for 5 and 7 wt. % LiCl added porous g-C_3N_4 and obtained yellows mass was termed as pCN-5Li and pCN-

7Li respectively. Figure B.2 shows the photograph of the acid-treated melamine + ethylene glycol and as-prepared alkali metal-doped porous g-C_3N_4.

B.2.4 Characterization Tools

X-ray diffraction (XRD) pattern was recorded from a Rigaku MiniFlex BENCHTOP 600 X-ray diffractometer having Ni-filtered Cu Kα1 radiation (λ = 1.54056 Å) at a scan rate of 3° min^{-1}. Scanning electron microscopy (SEM) images were collected from Jeol 7000 NeoScope Benchtop SEM at accelerating voltages of 5 and 10 keV. All electrochemical measurements were recorded on the USA made CHI7044 model of an electrochemical work station with the three-electrode setup. Saturated calomel electrode and the platinum electrode were deployed as reference and counter electrode respectively. Electrode material ink was prepared by taking 85:10:5 ratio of electrode material, activated carbon and Nafion and dispersed into 1:1 water-ethanol solution under sonication. Ink containing 1 mg of material was drop cast over the 1× 1 cm^2 area of Toray carbon paper and dried under an IR lamp. The ink-coated Toray carbon paper was used as the working electrode and current collector. All the electrochemical measurements were recorded in a 6M KOH solution.

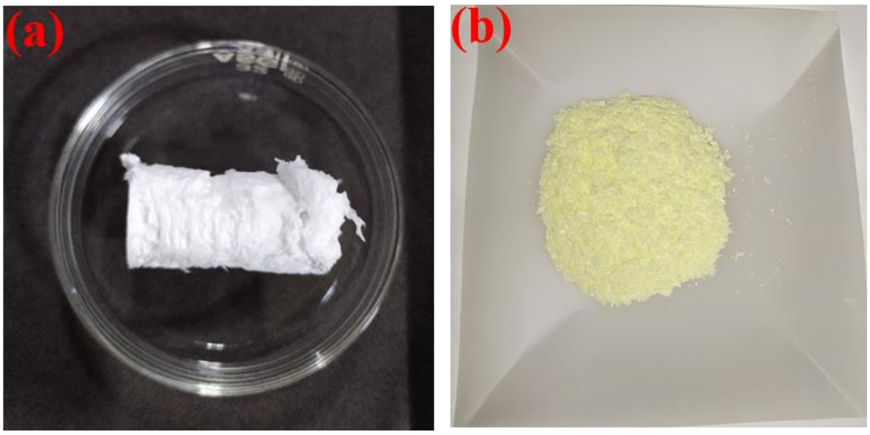

Fig. B.2 (a) Photograph of the acid-treated melamine (dispersed in ethylene glycol) and (b) the as-prepared alkali metal-doped porous g-C_3N_4.

B.3 Results and Discussion

B.3.1 Characterization of Porous g-C_3N_4 (pCN) and Alkali Metals Doped Porous g-C_3N_4 (pCN-M; M = Li/Na/K)

At first, an X-ray diffraction pattern was recorded in order to confirm the synthesis of prepared materials. Figure B.3 (a) shows the XRD spectra of pCN along with alkali metals added pCN-M. g-C_3N_4 has its characteristics intense peak at 27.4° appearing due to stacking of graphitic layers of carbon nitride and a smaller peak at 13.0° due to in-planer repeating of heptazine units. Both peaks are indexed as (002) and (100) planes respectively. The sharp intensity of the primary material g-C_3N_4 depicts its higher crystallinity and long-order arrangements. The pCN has relatively less intense peak at same 2θ position of 27.4° with a visible increase into its full width at half maximum (FWHM) value. The less intense peak of pCN signifies the decrease into its crystallinity as the dispersive medium ethylene glycol provides additional carbon to the structure during the synthesis process and breaks the long-range ordering of g-C_3N_4. The same weight of different alkali metal ions added pCN has a further relative decrease of peak intensity due to the varied intercalation of these metal ions into the formed porous structure.

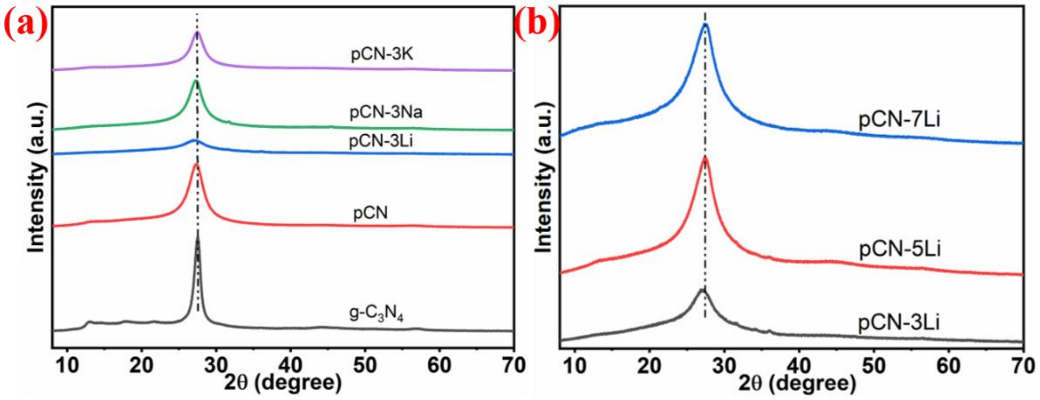

Fig. B.3 (a) X-ray diffraction pattern of different alkali metal-doped porous g-C_3N_4 (pCN) along with g-C_3N_4 and (b) X-ray diffraction pattern of 3/5/7 wt. % Li doped pCN materials.

The pCN-3K has intercalation of K+ ions into the g-C_3N_4 interlayer via bridging the layers. The K^+ ions interact with C and N atoms and affect the electronic environment around them; the resultant change in performance was studied in the electrochemical section. In the pCN-3Na structure, Na ions are tended to be doped in CN planes resulting in in-plane electron density as per reports.[259] The pCN-3Li has the smallest peak intensity among all. This is probably due to the small amount of Li metal ions present leading to greater intercalation into the g-C_3N_4 by virtue of its smaller size and greater disordering of structure. Figure B.3 (b) exhibits the XRD pattern of 3, 5 and 7 wt. % of Li metal ions doped pCN structures, change in relative peak intensities was observed. In the XRD patterns of all doped species, the peak position of 27.4° is unshifted in spite of intercalation of alkali metal species and visible change in porosity, this is probably due to the less amount of metal salts used during the synthesis process.

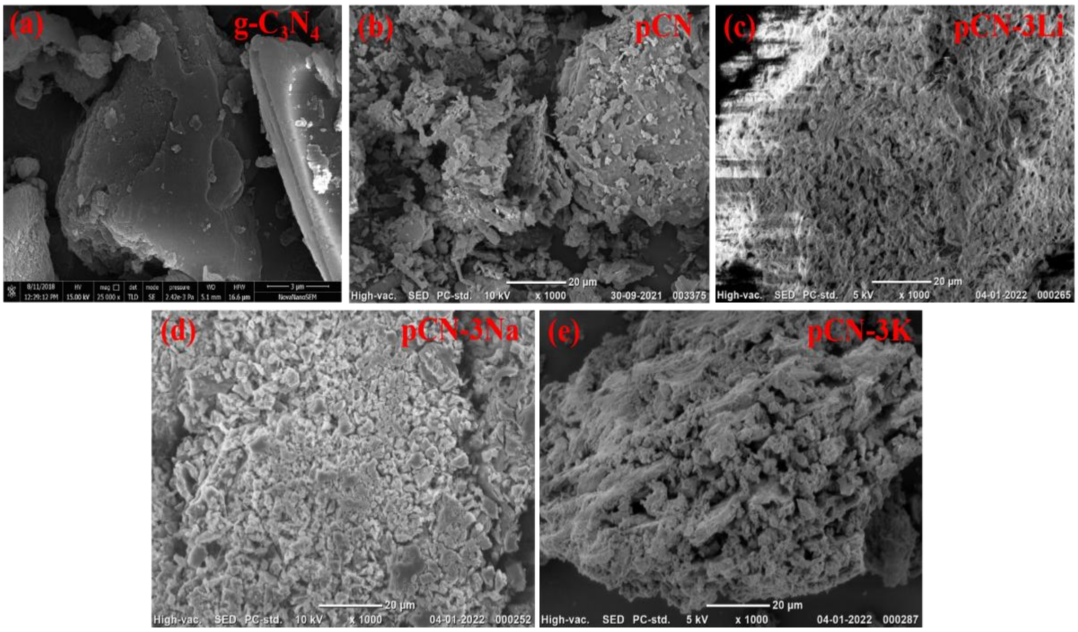

Fig. B.4 SEM images of (a) g-C_3N_4, (b) pCN, (c) pCN-3Li, (d) pCN-3Na and (e) pCN-3K.

Figure B.4 depicts the surface images of the g-C_3N_4, p-CN and all 3 % alkali doped pCN samples viz. pCN-3Li, pCN-3Na and pCN-3K. All images are at equal magnification for sake of comparison. g-C_3N_4 has flakes of plane texture, while others have rough morphology. Greater porosity is visible in pCN structure (see Fig. B.4 (b)) owing to acid treatment and ethylene glycol dispersion. Sheets of g-C_3N_4 are mangled and smaller flakes-like structures are visible of size limited to few hundred nm, at some places small flakes and ribbon structures are also visible for pCN. Other alkali metal-doped pCN species viz. pCN-3Li, pCN-3Na and pCN-3K exhibit similar porous flakes of varying degrees.

Figure B.5 exhibits the SEM images of 3, 5 and 7 wt. % Li added porous carbon nitride structure. All species have similar morphology with no visible impact of the presence of the different amounts of Li metal ions into the structure. The addition of ethylene glycol has a clear impact on the morphology of the as-prepared pCN compared to pure g-C_3N_4 as it enhances the carbon content into the g-C_3N_4 and also tames its surface appearance.

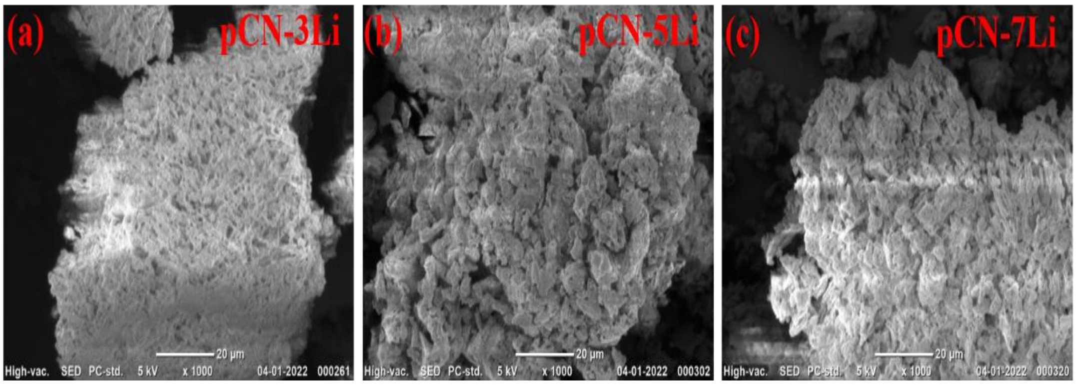

Fig. B.5 SEM images of (a) pCN-3Li, (b) pCN-5Li and (c) pCN-7Li.

After establishing the structural and morphological features of our prepared doped material, we performed electrochemical charge storage measurements-galvanic charge-discharge (GCD) and cyclic voltammetry (CV) to study its storage properties.

B.3.2 Electrochemical Measurements

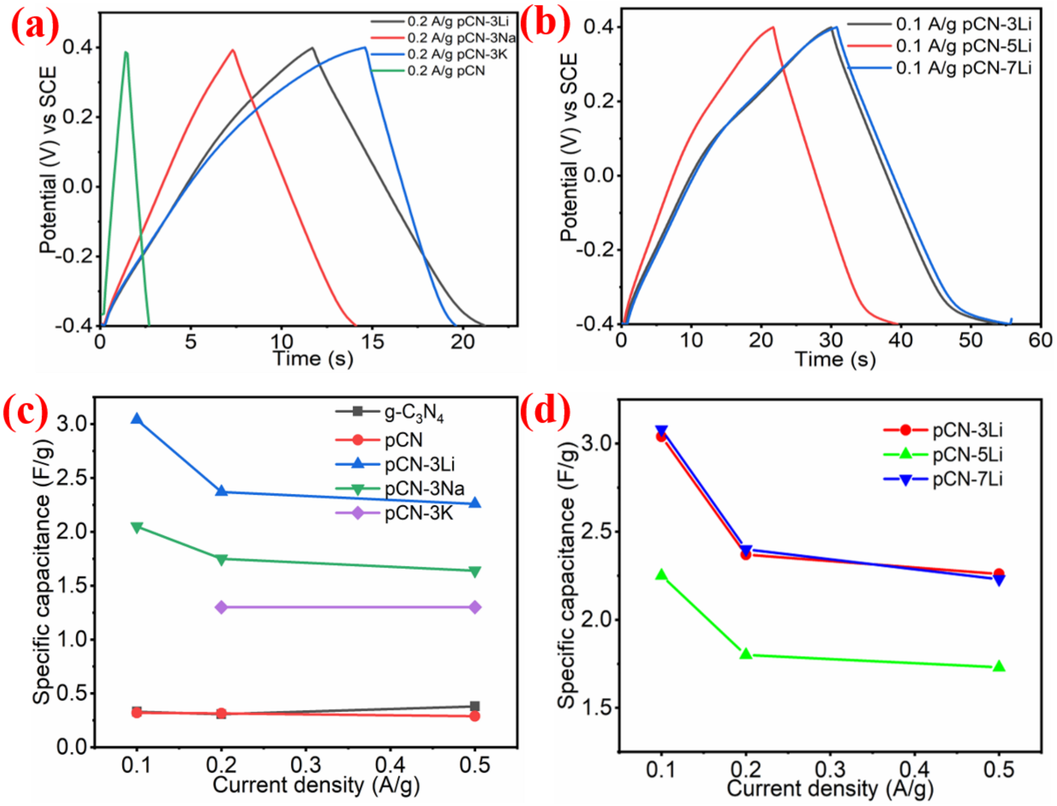

Fig. B.6 (a) GCD curves of pCN, pCN-3Li, pCN-3Na and pCN-3K at current density of 0.2 A/g, (b) GCD curves of 3/5/7 wt. % Li added pCN at 0.1 A/g, (c) comparison plot of specific capacitance at 0.1, 0.2 and 0.5 A/g for g-C_3N_4, pCN, pCN-3Li, pCN-3Na and pCN-3K and (d) comparison plot of specific capacitance at 0.1, 0.2 and 0.5 A/g for 3/5/7 wt. % Li added pCN.

Figure B.6 (a) shows the charge-discharge curve at the current density of 0.2 A/g for pCN, pCN-3Li, pCN-3Na and pCN-3K in 6M KOH solution. The presence of intercalated alkali metals into the pCN causes higher discharge time to pCN alone. pCN-3Li has the highest discharge time among others that can be credited to the more intercalation of Li metal ion enhancing the conductivity of doped structure. pCN-3Na also exhibit better discharge time to pCN-3K that result in higher specific capacitance shown in the combined plot of specific capacitance vs current density (see Fig. B.6(c)).

The g-C_3N_4 and pCN show similar charge storage behaviours at different current densities. All doped species of different alkali metals show the following trend for specific capacitance values for a fixed current density of 0.2 A/g.

pCN-3Li > pCN-3Na > pCN-3K > pCN

We conclude that the observed trend for Cs value follows the influence of the size of intercalating ions, as a smaller size of Li is expected to be better intercalate into porous g-C_3N_4 leading to enhanced conductivity and charge storage properties for pCN-3Li. Now, we tried to study the charging-discharging of different wt. % of Li doping into the pCN structure viz. 3, 5 and 7 wt.%

The GCD performance of 3, 5 and 7 wt. % Li doped pCN at 0.1 A/g is shown in Fig. B.6 (b). pCN-3Li and pCN-7Li both exhibits almost equal discharge time at 0.1 A/g and this value is higher to pCN-5Li. The evaluation of specific capacitance of pCN-3Li, pCN-5Li and pCN-7Li at different current densities viz. 0.1, 0.2 and 0.5 A/g are shown in the combined plot of Fig. B.6 (d). The 3 and 7 wt. % Li doping into pCN yields nearer specific capacitance values, pCN-5Li has the least specific capacitance among them. The GCD curves of pCN-3Li at different current densities 0.1, 0.2 and 0.5 A/g is also shown in Fig. B.7

The obtained result establishes the supremacy of 3 and 7 wt. % of Li doping into porous g-C_3N_4 for grater charge storage to other alkali metals doped porous g-C_3N_4 and g-C_3N_4 itself.

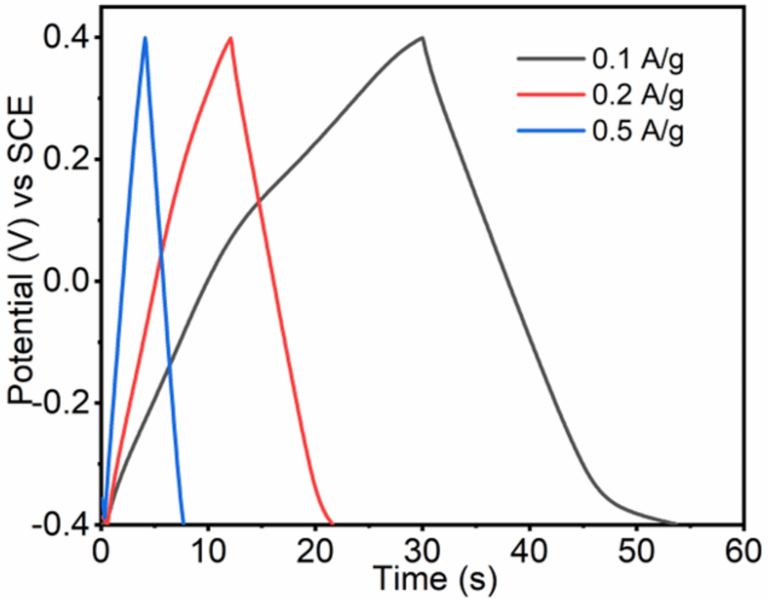

Fig. B.7 GCD curves of pCN-3Li at current density 0.1, 0.2 and 0.5 A/g.

We also recorded the cyclic voltammogram of the prepared samples at a dynamic scan rate of 100 mV/sec in the potential window of -0.4 to +0.4 using the same set-up (see Fig. B.8). The chosen potential window provides capacitive current purely due to electrochemical double layer formation at the electrode-electrolyte interface. The obtained curve area under the current-voltage plot is as follow

pCN-3Li > pCN-3Na > pCN-3K > pCN > g-C_3N_4

The 3% Li doped porous g-C_3N_4 (pCN-3Li) exhibit the highest area under curve among all species, it’s the virtue of enhanced porosity, conductivity and charge storage at the interface. The cyclic voltammogram of 3, 5 and 7 wt. % Li doped pCN samples are also shown in Fig. B.8 (b). Herein, the 7 wt.% Li doping into pCN structure outperforms other samples with the highest area under the curve, a depiction of greater charge storage by it. pCN-7Li is followed by pCN-3Li and pCN-5Li for the total area in the CV plot.

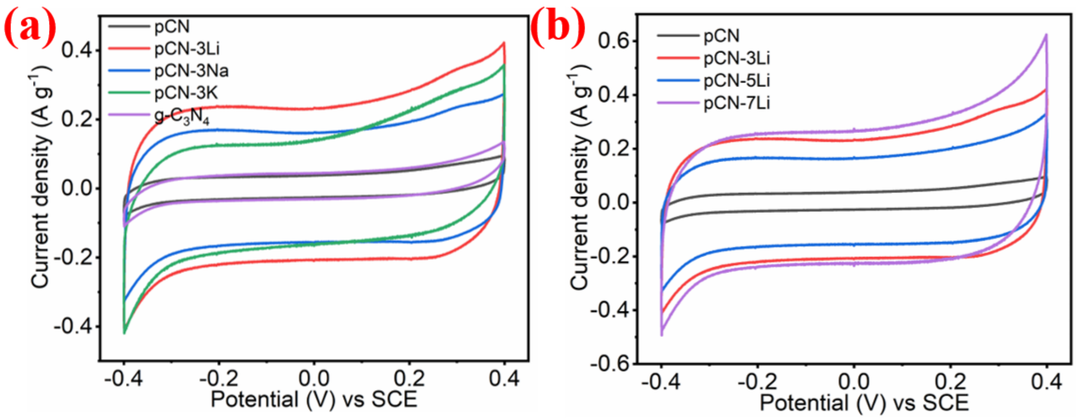

Fig. B.8 (a) Cyclic voltammograms of g-C_3N_4, pCN, pCN-3Li, pCN-3Na and pCN-3K and (b) pCN and 3/5/7 wt. % Li doped pCN at a scan rate of 100 mV/sec.

B.4 Conclusions

The different alkali metal ions doped porous structure of g-C_3N_4 was prepared in a single thermal stage. The pre-treatment of g-C_3N_4 precursor with nitric acid and addition of ethylene glycol as dispersive medium create the porous structure with an increase in carbon content. The presence of intercalated alkali metal ions in the porous g-C_3N_4 enhances the charge storage at the electrode-electrolyte interface. Li intercalated porous g-C_3N_4 exhibit the highest charge storage compared to other alkali metal Na and K doped porous g-C_3N_4 under similar conditions due to the small size of intercalating ion. Intercalated Li^+ at interlayers of g-C_3N_4 enhances the conductivity of electrode material and additional carbon creates porosity and channelling of charges through layers. Although the obtained quantity of specific capacitance is not high, the presented work is at the preliminary stage and further optimization is needed to obtain a significant charge storage property.

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List of Publications

I. Published work

- **A. Jaiswal**, S. Pal, A. Kumar, R. Prakash, "Metal free triad from red phosphorous, reduced graphene oxide and graphitic carbon nitride (red P-rGO-g-C3N4) as robust electro-catalysts for hydrogen evolution reaction" Electrochimica Acta 338 (2020) 135851. https://doi.org/10.1016/j.electacta.2020.135851

- **A. Jaiswal**, R. Kumar, R. Prakash, "Iron/Iron Carbide (Fe/Fe_3C) Encapsulated in S, N Codoped Graphitic Carbon as a Robust HER Electrocatalyst" ACS Energy & Fuels 35, 19, (2021) 16046–16053. https://doi.org/10.1021/acs.energyfuels.1c02125

- **A. Jaiswal**, A. Kumar, R. Prakash, "Facile synthesis of doped CxNy QDs as photoluminescent matrix for direct detection of hydroquinone" Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy 246 (2021) 119019. https://doi.org/10.1016/j.saa.2020.119019

- **A. Jaiswal**, N. Kumari, A. Kumar, R. Prakash, "Comparative Study of Enhanced Photodegradation of Azo Dye by $Ag_2O/SnO_2@g\text{-}C_3N_4$ Nanocomposite under Natural and Artificial Light Sources" Materials Chemistry and Physics 281 (2022) 125884. https://doi.org/10.1016/j.matchemphys.2022.125884

- C. J. Verma, A. Kumar, S. Pal, S. Sinha, A. K. Singh, **A. Jaiswal**, R. Prakash, "Polyaniline stabilized activated carbon from Eichhornia Crassipes: Potential charge storage material from bio-waste" Renewable Energy 162 (2020) 2285-2296. https://doi.org/10.1016/j.renene.2020.09.135

- C. Shekhar, **A. Jaiswal**, G. Ji, R. Prakash, Ethanol extract of waste potato peels for corrosion inhibition of low carbon steel in chloride medium, Materials Today: Proceedings 44 (2021) 2267–2272. https://doi.org/10.1016/j.matpr.2020.12.368 (Equal contribution work)

- S. Maurya, **A. Jaiswal**, G. Ji, R. Prakash, Waste Solanum melongena stem extract for corrosion inhibition of mild steel in 1M NaCl, Materials Today: Proceedings 44 (2021) 2716–2720 https://doi.org/10.1016/j.matpr.2020.12.691

- Rajul Sharma, **A. Jaiswal**, Vinit Kumar Jha, A.V. Ullas, Gopal Ji, Rajiv Prakash, Drop cast coating of leather dye on copper and investigation of its corrosion behaviour in sodium chloride solutions Materials Today: Proceedings 62 (2022) 2965-2969. https://doi.org/10.1016/j.matpr.2022.02.571

II. Work under communication

A. Jaiswal, A. Kumar, S. Kumar, R. Prakash, “Alkali metal (Li/Na/K) intercalated morphology control synthesis of g-C_3N_4 for greater charge storage”

A. Jaiswal, R. Kumar, R. Prakash, “Heteroatom doped carbon encapsulated iron carbide as a non-precious metal catalyst for oxygen reduction reaction”

P. Singh, R. P. Ojha, **A. Jaiswal**, Rajiv Prakash, “Simultaneous Colorimetric detection of Acid Phosphatase (ACP) and Ascorbic acid (AA) based on novel Pt-C_3N_4 nanocomposite”

R. Lohra, **A. Jaiswal**, R. Prakash, M.P. Rai. “Photocatalytic GO@g-C_3N_4 assisted stimulated biomass and lipid production by *Chlorosarcinopsis* sp. MAS04: A nano-bio hybrid approach”

R. Lohra, **A. Jaiswal**, R. Prakash, M.P. Rai, Response surface methodology aided optimization of TiO_2@g-C_3N_4 for biomass enhancement and improved biodiesel production from Asterarcys sp.

List of Workshop/Symposium/Conference/Webinar Attended (Oral/Poster Participation)

- Workshop on “Research Writing and Publishing” organized by Teaching Learning Centre at IIT (BHU), Varanasi. Sep, 2019.
- Seminar on “Avenues in Aeronautical R&D for Indian Defence” organized by Aeronautics Research & Development Board, Aerospace Resources Panel at IIT (BHU), Varanasi. March, 2018.
- Poster presentation in “International Conference on Advances in Polymer Science & Technology” organized by Asian Polymer Association (APA) at Kathmandu, Nepal, November, 2018.
- Poster presentation in “The Institute Day” organized by IIT (BHU) at SMST, IIT (BHU), Varanasi, February, 2018.
- Oral Presentation in “The 31st Annual Meeting of The Materials Research Society of Japan MRS-J (2021)” at Yokohama, Japan, December, 2021.
- National Symposium on “Contemporary Trends and Future Prospects of Functional Materials (CTFM)-2019” organized by Department of Chemistry, Institute of Science, B.H.U., November 2019.
- ACS Webinar on “Science, Technology and Innovation: Key Drivers for Aatmanirbhar Bharat” on 23, December, 2021.
- ACS Publication Symposium “The Power of Chemical Transformations” in partnership with the University of Hong Kong (Virtual Event), May, 2021.
- International Webinar on “Current Trends and Future Prospective of Chemistry in Pandemic Era, September 28-29, 2020” organized by Department of Chemistry, DDU Gorakhpur University, Gorakhpur, India (Via Zoom).

WEBINARS

- Poster presentation in “2020 #RSC Poster Twitter Conference” organized by RSC Twitter Conference, 2020.
- Wiley Author Webinar Series “Learn to Publish” held in June-July 2020, organized by WILEY.
- “RSC Desktop Seminar with Chem Comm (8 Sep)” organized by RSC Publishing Webinars, 2020.
- “Meet the Editor Online: Chem Comm (14 July)” organized by RSC Publishing Webinars, 2020.
- “Meet the Editor Online: RSC Advances (15 Sep)” organized by RSC Publishing Webinars, 2020.
- “RSC Desktop Seminar with RSC Advances (5 Oct)” organized by RSC Publishing Webinars, 2020.
- “Meet the Editor Online: Current landscape of Open Access publishing and RSC” organized by RSC Webinars, 2020.
- “RSC-IIT Desktop Seminar with JMC-A” organized by RSC Publishing Webinars, 2020.
- Webinar on “What does the trusty worthy peer review look like?” organized by RSC Publishing Webinars, 2020.

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